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(56) Documents Cited
EP 0227072 A2 EP 0203853 A

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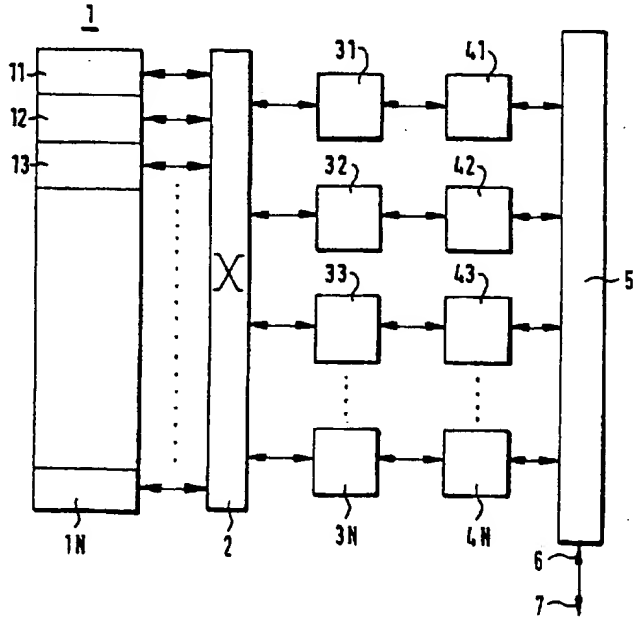
(54) Abstract Title

Satellite system with resources that are capable of being temporarily allocated to individual subscribers

(57) In the case of a satellite system, several satellite resources (1) are capable of being temporarily allocated to individual subscribers. Individual-subscriber encryption devices (31, 32, 33 ... 3N) are capable of being connected to these satellite resources (1) via a call-control device (2). The encryption devices access a common data bus (5). By virtue of these measures a flexible allocation of satellite resources (1) can be achieved without other subscribers obtaining knowledge about the allocation of the resources or the setting parameters thereof.



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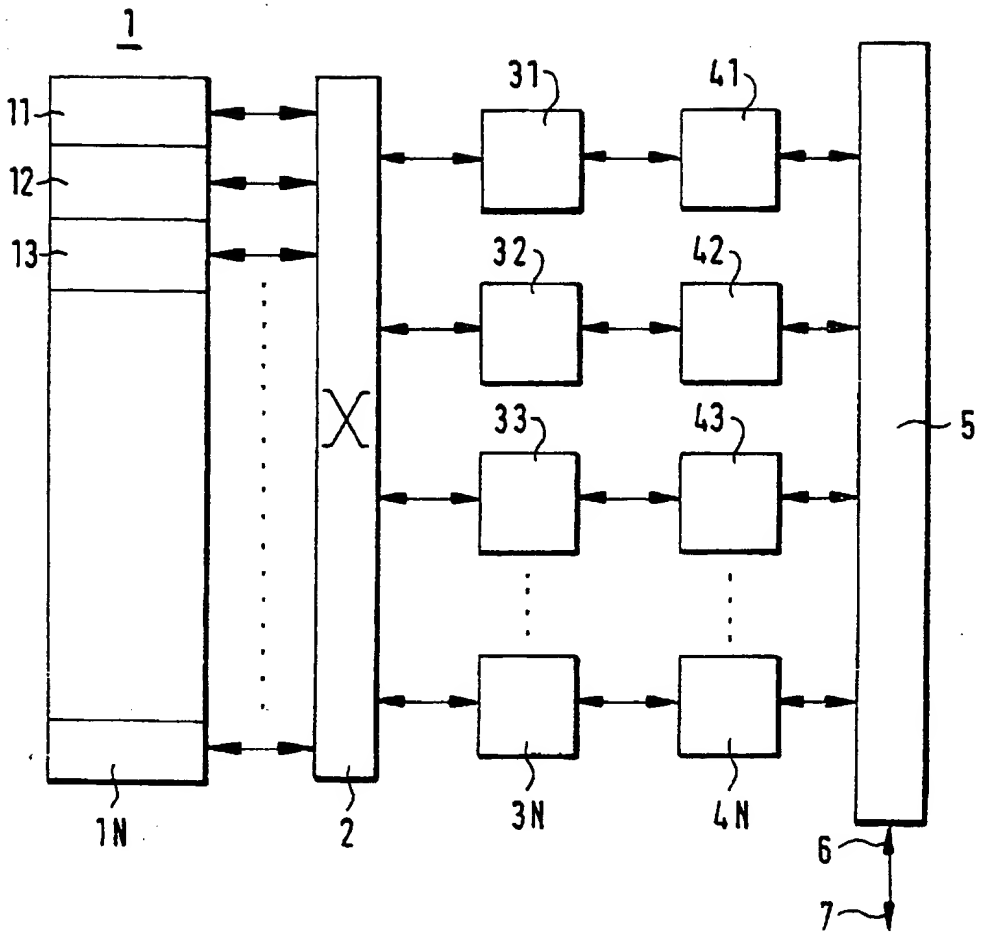
1
11
12
13
1N
2
31
32
33
3N
41
42
43
4N
5
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Satellite system with resources that are capable of being temporarily allocated to individual subscribers

State of the Art

Satellite systems with a switching function in the satellite permit arbitrary through-connections between input and output channels of a transponder. From "Nachrichtenübertragung über Satelliten", second edition, Herter/Rupp, Springer-Verlag, Berlin/Heidelberg 1983, pages 121 to 123, it is known to address various satellite resources such as aerials, amplifiers, mixers etc via a switching matrix. A modular on-board switching system (MOBS) for satellites is known from ANT Nachrichtentechnische Berichte, Volume 8, February 1991, pages 16 to 23. With this it is possible to convert the signals of the earth stations into the baseband in the satellite, to decode them and to switch them on the level of individual calls to the output intended for the respective spot. This baseband switching enables a very flexible allocation of capacity. Within the scope of the capacities available for the downlinks the calls transmitted by each earth station can be switched in arbitrary proportions into arbitrarily many spots. For the uplink to the satellite, use is made of the TDMA method, which makes the entire bandwidth of the transmission channel available to each earth station for a short time-slot. For the downlink a pure TDM method is used. In this system each earth station pertaining to an illuminated territory (spot) receives the entire data stream of the carrier of the downlink in question and filters out for itself the relevant information and user data.

Advantages of the Invention

With the measures according to Claim 1 it is possible to make arbitrary satellite resources available to subscribers without other subscribers gaining insight into

the allocation of these satellite resources or the settings thereof - for example, aerial orientation, transmit power, frequency-band allocation. Each subscriber can employ his proprietary cryptoalgorithm in his encryption device and hence prevent other subscribers from obtaining knowledge about information that is not intended for them or, for example, from being able to find out, via the spot orientation for example, with which target areas other subscribers are making connection.

Nevertheless a flexible allocation of capacity is possible, since resources no longer required by one subscriber can be released for other subscribers. Any setting parameters used, such as aerial orientation, transmit power, conversion frequencies or filter-band frequencies, can be reset, prior to release, into a neutral initial position which allows no inferences of any kind to be made as to the previous utilisation.

The satellite system according to the invention may be configured arbitrarily. Services relevant to security can be operated alongside other services without special precautionary measures. It is not possible for unauthorised subscribers to influence the resources.

Drawing

Examples of embodiments of the invention will be elucidated in more detail on the basis of the drawing, which shows a block diagram.

Description of Embodiment Examples

A satellite system according to the invention is represented in Figure 1. Satellite resources 1, for example aerials, transmitters, receivers, converters, filters, amplifiers, etc, are combined in particular into groups 11, 12, 13, ... 1N of

individual components of the same type. There are N satellite resources, for example N1 aerials, N2 receive systems, N3 amplifiers ..., where N = N1 + N2 + N3 + ... Communication subscribers to the satellite system are able to access these satellite resources 1 temporarily if these resources have been occupied via the individual-subscriber encryption devices 31, 32, 33, ... 3N assigned to them. Occupancy of the resources 2 is effected via a common call-control device 2 between the encryption devices 31, 32, 33, ... 3N and the satellite resources 1. This common call-control device 2 carries out the management of the resources; that is to say, it determines which subscriber has access to which of the satellite resources.

The encryption devices 31, 32, 33 ... 3N, in each case together with the satellite resources requested via the call-control device 2, form a satellite subsystem that is subject to exclusive control and availability of a particular subscriber group. Other subscribers or subscriber groups have no access whatever to the resources for the time of occupancy by a first subscriber group, since the encryption device 31 of the first subscriber group together with the call-control device 2 blocks access for other subscribers or subscriber groups. Only when the satellite resources occupied by the first subscriber group are released again can further subscribers or subscriber groups take advantage of being allocated these satellite resources.

The call-control device 2 has a switching or cross-connect function for temporary connection of the individual encryption devices 31, 32, 33 ... 3N to the satellite resources. Since, in particular, only relatively slow binary data, for example telemetry signals, are to be processed, the data throughput to be managed by the call-control device 2 is low. The call-control device 2 may, for example, be constructed on the basis of a processor in the manner of the on-board switching system described in ANT Nachrichtentechnische Berichte, Volume 8, February 1991, pages 20 to 22.

With a view to controlling the flow of data from and to the individual encryption devices 31, 32, 33 ... 3N a data bus 5 is provided which is capable of being utilised jointly by all subscriber groups and which is accessed by the individual encryption devices 31, 32, 33 ... 3N via bus-access units 41, 42, 43 ... 4N. The bus-access units comprise receive interfaces in the receive direction, so that each encryption device 31, 32, 33 ... 3N can monitor the uplink data stream 6 on the bus 5. However, on account of the encryption a particular encryption device 31, 32, 33 ... 3N can only read, interpret and relay in decrypted form, for example to the satellite resources, data that are encrypted with the encryption algorithm and/or key known to it. In the transmit direction the bus-access units 41, 42, 43 ... 4N comprise transmit interfaces, in order that the respective encryption devices are able to insert or multiplex into the downlink data stream, for example into a TDM frame, their data intended for the downlink 7 in a form encrypted by an individual subscriber or individual subscriber group.

Control and monitoring of the resource occupancy are undertaken by the call-control device 2. In order that no inferences can be drawn, after utilisation of the resources by a first subscriber or subscriber group, as to settings of the resources such as spot orientation, transmit power, frequency band etc, the setting parameters are preferably reset into a neutral initial setting prior to release of the resource for other subscribers or subscriber groups.

Any configuration of the resources is possible. For instance, four aerials for various spots but only two transmitting and receiving devices can be assigned temporarily to one subscriber group, with corresponding amplifiers, converting and filtering devices.

The individual-subscriber keys of the encryption devices may also be changed, for example by remote transmission of keys via the uplink/downlink. Key management in the encryption devices 31, 32, ... 3N is performed by these

encryption devices themselves, independently of one another. Devices corresponding to the encryption devices in the satellite have to be provided in the participating ground stations.

A satellite system according to the invention may also consist of several satellites (several primes), the resources of which are capable of being utilised jointly by subscribers. In this case the subscribers may access, via their bus-access devices, a corresponding data bus pertaining to each satellite.

Claims

1. Satellite system consisting of the following units:

- several satellite resources (1) that are capable of being temporarily allocated to individual subscribers,

- a call-control device (2) between the satellite resources (1) that are capable of being allocated to individual subscribers and individual-subscriber encryption devices (31, 32, 33 ... 3N),

- bus-access units (41, 42, 43 ... 4N) between the individual-subscriber encryption devices (31, 32, 33 ... 3N) and a data bus (5) that is capable of being utilised jointly for the subscribers.

2. Satellite system according to Claim 1, characterised in that the call-control device (2) has a switching or cross-connect function and is also suitable for monitoring the allocation of resources.

3. Satellite system according to Claim 1, characterised in that the satellite resources consist of groups (11, 12, 13 ... 1N) of individual components of the same type, for example aerials, amplifiers, receivers, transmitters, converters, filters, whereby individual components of a group are capable of being connected in each case only to the encryption device (31, 32, 33 ... 3N) of that subscriber or subscriber group which has occupied these satellite resources.

4. Satellite system according to one of Claims 1 to 3, characterised in that the satellite resources (1) or the setting parameters thereof are capable of being reset into a neutral initial setting after utilisation by a subscriber or subscriber group and are only capable of being occupied by other subscribers when they are released by

the subscriber(s) who had occupied them previously, via the encryption device of said subscriber(s).

5. Satellite system according to one of Claims 1 to 4, characterised in that satellite resources (1) are blocked for other subscribers in the event of occupancy by a subscriber via the encryption device (31, 32, 33 ... 3N) of said subscriber.

6. Satellite system according to one of Claims 1 to 5, characterised in that encryption devices (31, 32, 33 ... 3N) are connected to the data bus (5) via receive interfaces of the bus-access units (41, 42, 43 ... 4N) in such a way that each subscriber or subscriber group can monitor, via its encryption device (31, 32, 33 ... 3N), the uplink data stream on the data bus (5) but can only read, interpret and relay to the satellite resources (11, 12, 13 ... 1N) in decrypted form the part of the information that is intended for him and that is encrypted by an individual subscriber.

7. Satellite system according to one of Claims 1 to 6, characterised in that the encryption devices (31, 32, 33 ... 3N) are connected to the data bus (5) via transmit interfaces pertaining to the bus-access units (41, 42, 43 ... 4N) in such a way that each encryption device (31, 32, 33 ... 3N) can insert or multiplex into the downlink data stream its data intended for the downlink in a form encrypted by an individual subscriber.

8. Satellite system according to one of Claims 1 to 7, consisting of a plurality of satellites, the resources (1) of which are capable of being utilised jointly by subscribers, whereby the subscribers are able to access a corresponding data bus (5) of these satellites via corresponding bus-access units (41, 42, 43 ... 4N).

9. A satellite system substantially as hereinbefore described with ref erence to the accompanying drawings.

The Patent Office

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INVESTOR IN PEOPLE

Application No: GB 9902312.9 **Examiner:** Robert Macdonald
Claims searched: 1-9 **Date of search:** 8 June 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): H4L(LBSX, LDGP, LDGX, LDRRX); H4P(PPEB)

Int Cl (Ed.6): H04B(7/185); H04K(1/00); H04Q(7/38)

Other: ONLINE: WPI, EPODOC, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	EP 0227072 A2	(AMERICAN TELEPHONE AND TELEGRAPH COMPANY) Whole document.	
A	EP 0203853 A	(SATELLITE FINANCIAL SYSTEMS) Whole document.	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.